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Talpe

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(54) **LOCK FOR A HINGED CLOSURE MEMBER**

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E05B 63/18	(2006.01)
E05B 63/06	(2006.01)
E05B 15/04	(2006.01)
E05B 63/04	(2006.01)

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CPC ***E05B 59/00*** (2013.01); ***E05B 15/04*** (2013.01); ***E05B 55/12*** (2013.01); ***E05B 63/0021*** (2013.01); ***E05B 63/044*** (2013.01); ***E05B 63/06*** (2013.01); ***E05B 63/18*** (2013.01); *E05B 2015/0413* (2013.01)

(58) **Field of Classification Search**

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USPC ..... 70/104, 106–111, 134, 150, 151 R, 70/151 A, 153, DIG. 6, DIG. 60, DIG. 63; 292/33, 34

See application file for complete search history.

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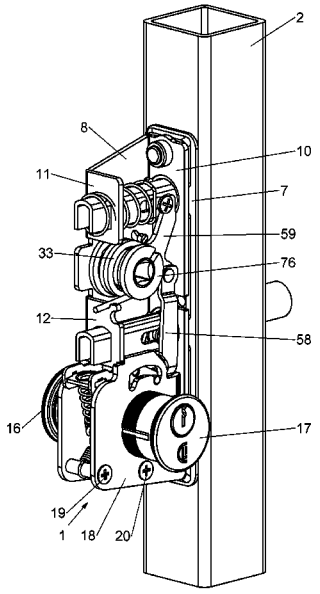
(57) **ABSTRACT**

A lock comprising a latch bolt and a dead bolt, a dead bolt lever to move the dead bolt, a key actuated cylinder with a rotary driving bit, a second turn latch bolt lever to move the latch bolt by using the key, a second turn latch bolt driver as an intermediary between the driving bit and the second turn lever, a spring urging the second turn driver in the path of the driving bit, and a locking mechanism to lock the dead bolt. The second turn driver comprises a follower portion which, upon actuation by the driving bit, moves the second turn driver out of the path of the driving bit thereby preventing the driving bit from being blocked. The locking mechanism comprises a slot having two catches and a spring biased lever mounted on the dead bolt lever to lock the dead bolt lever.

20 Claims, 11 Drawing Sheets



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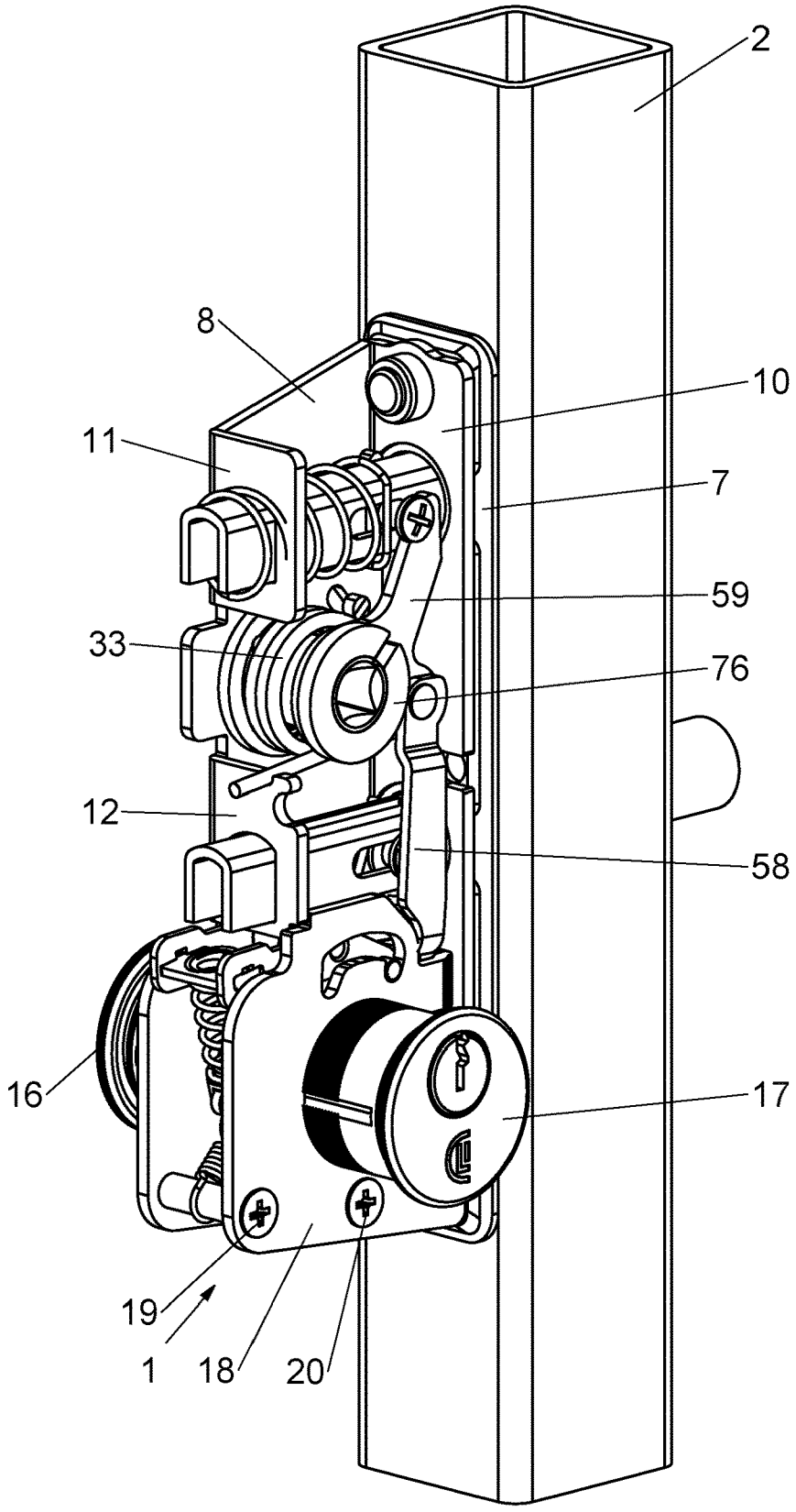

Fig. 1

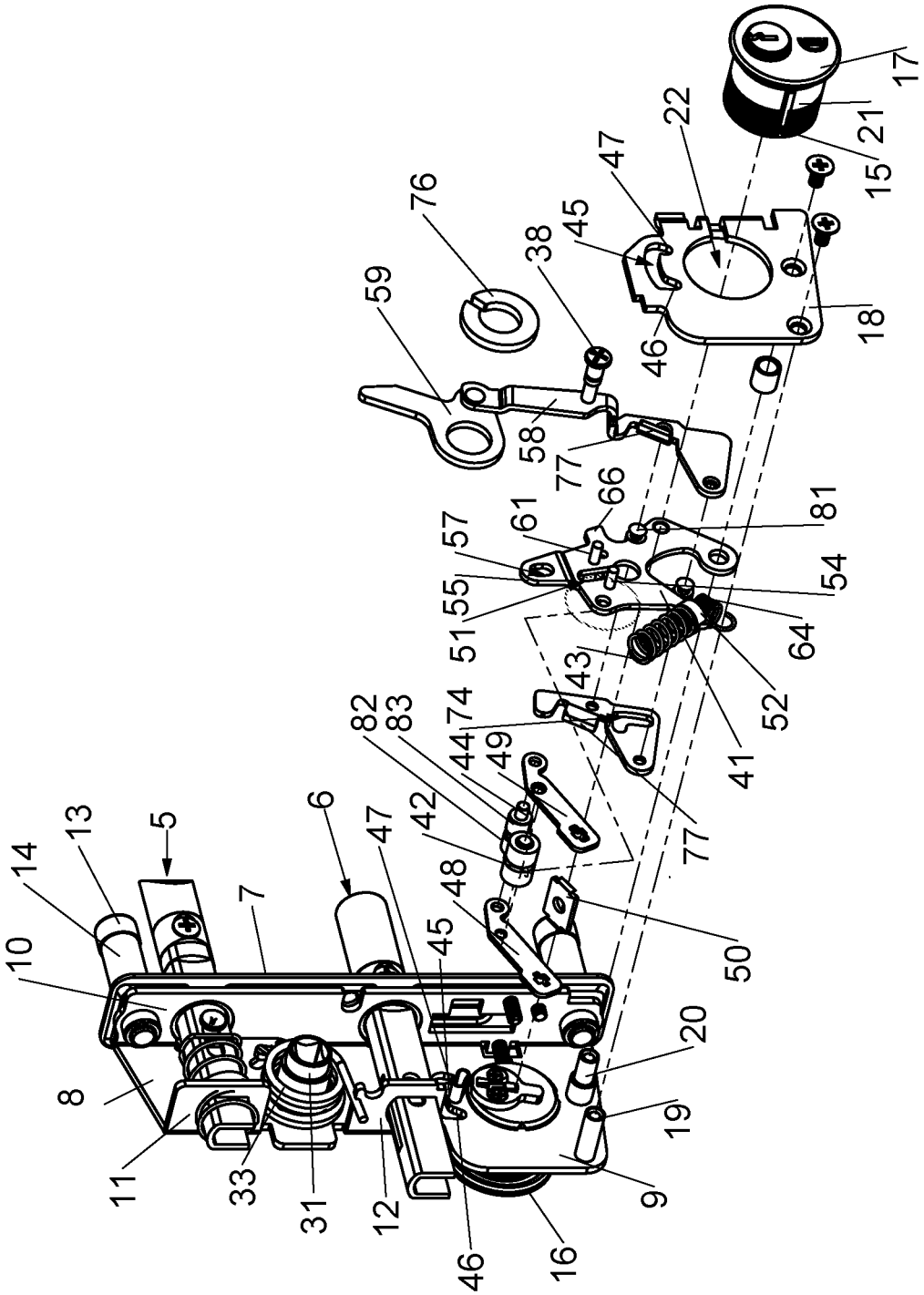
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Fig. 2

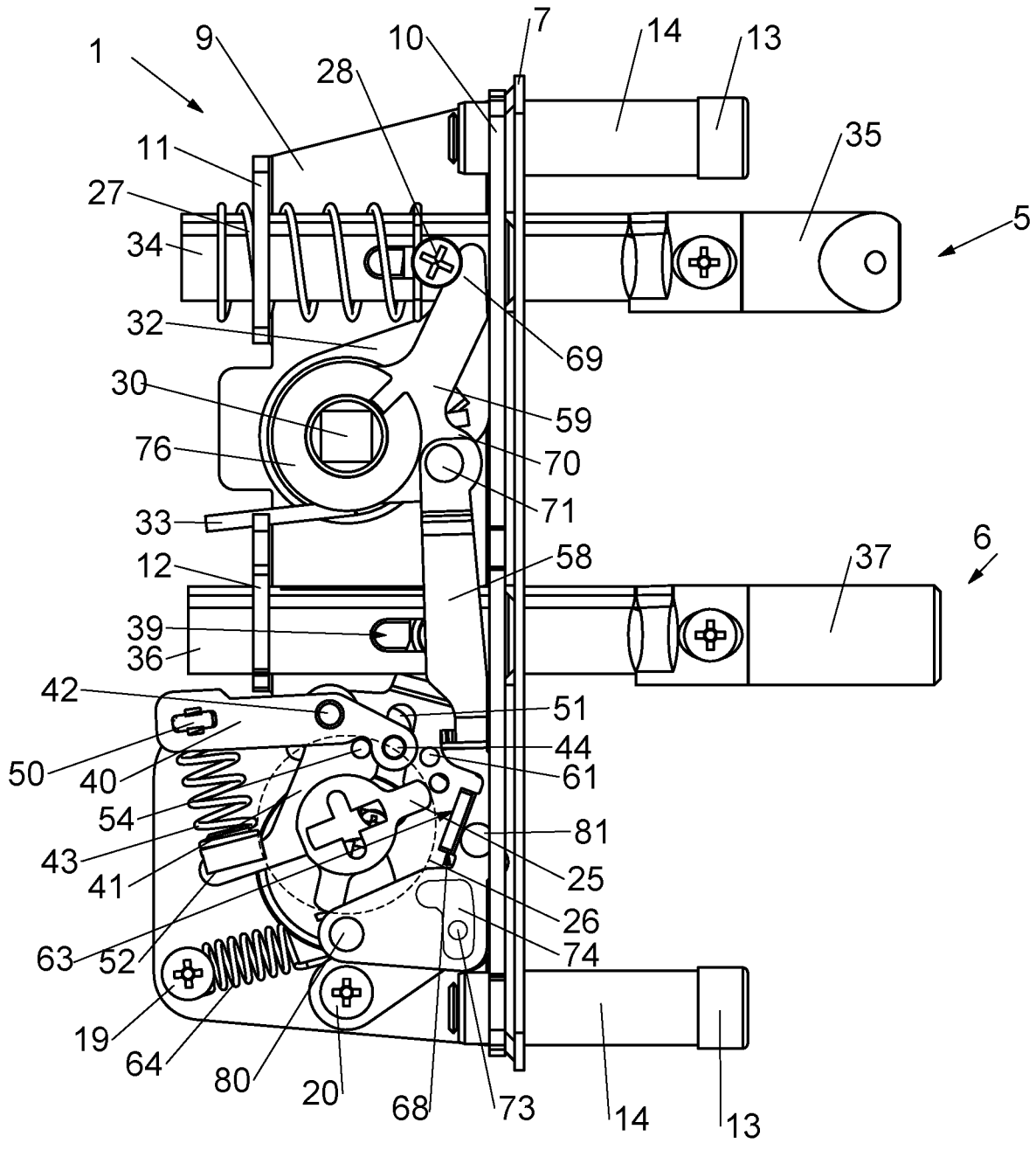
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Fig. 3

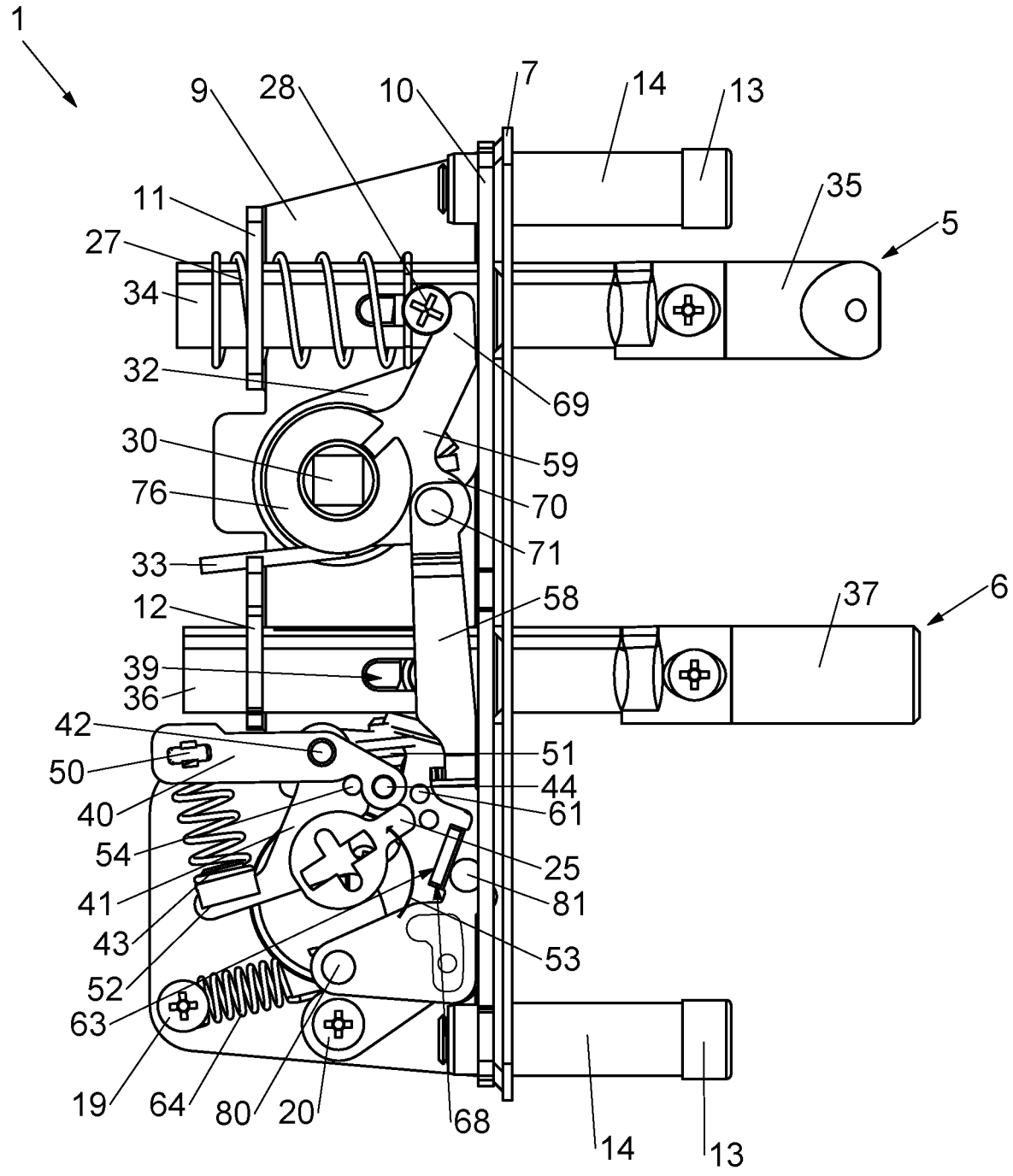
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Fig.4

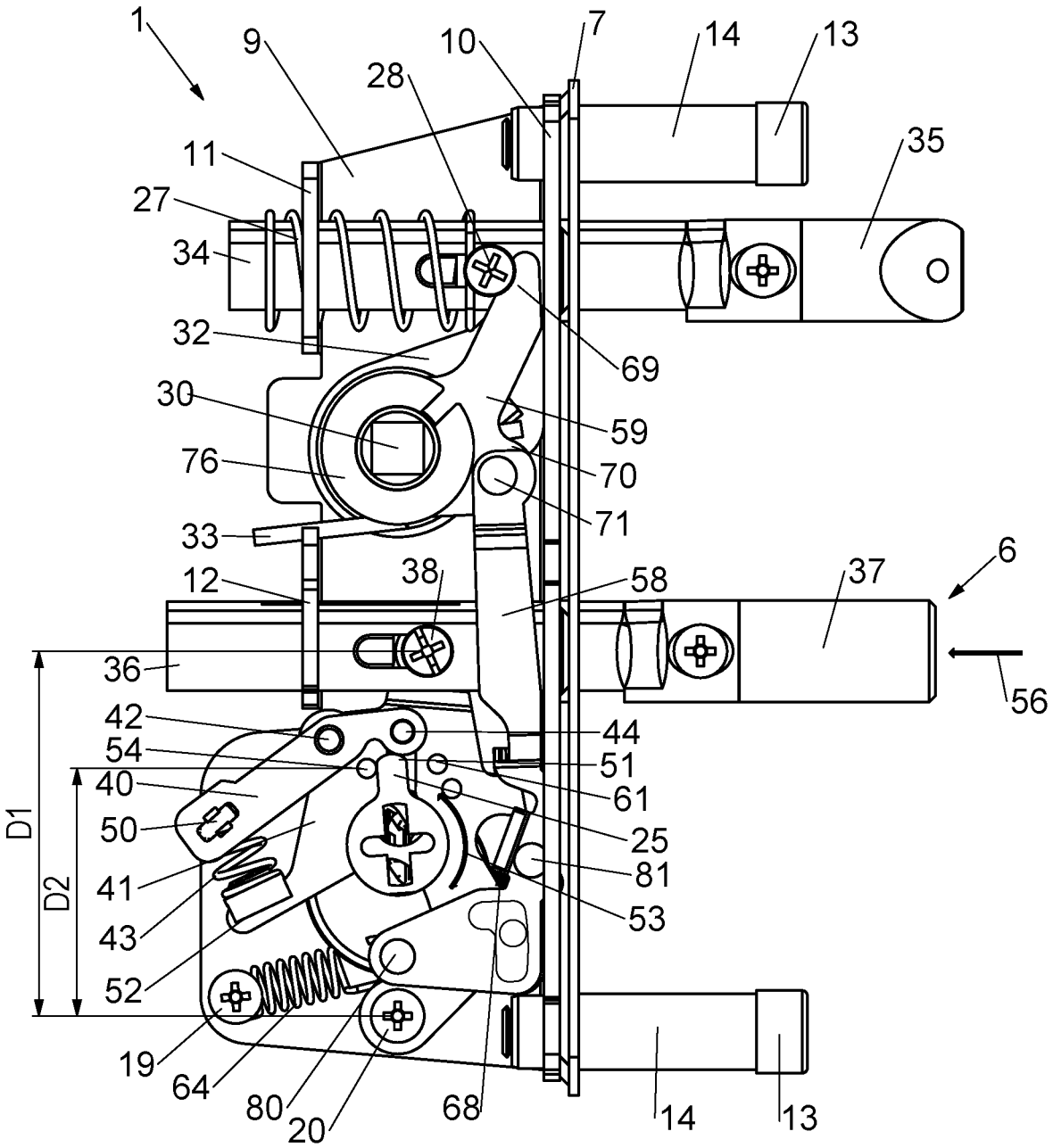
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Fig. 5

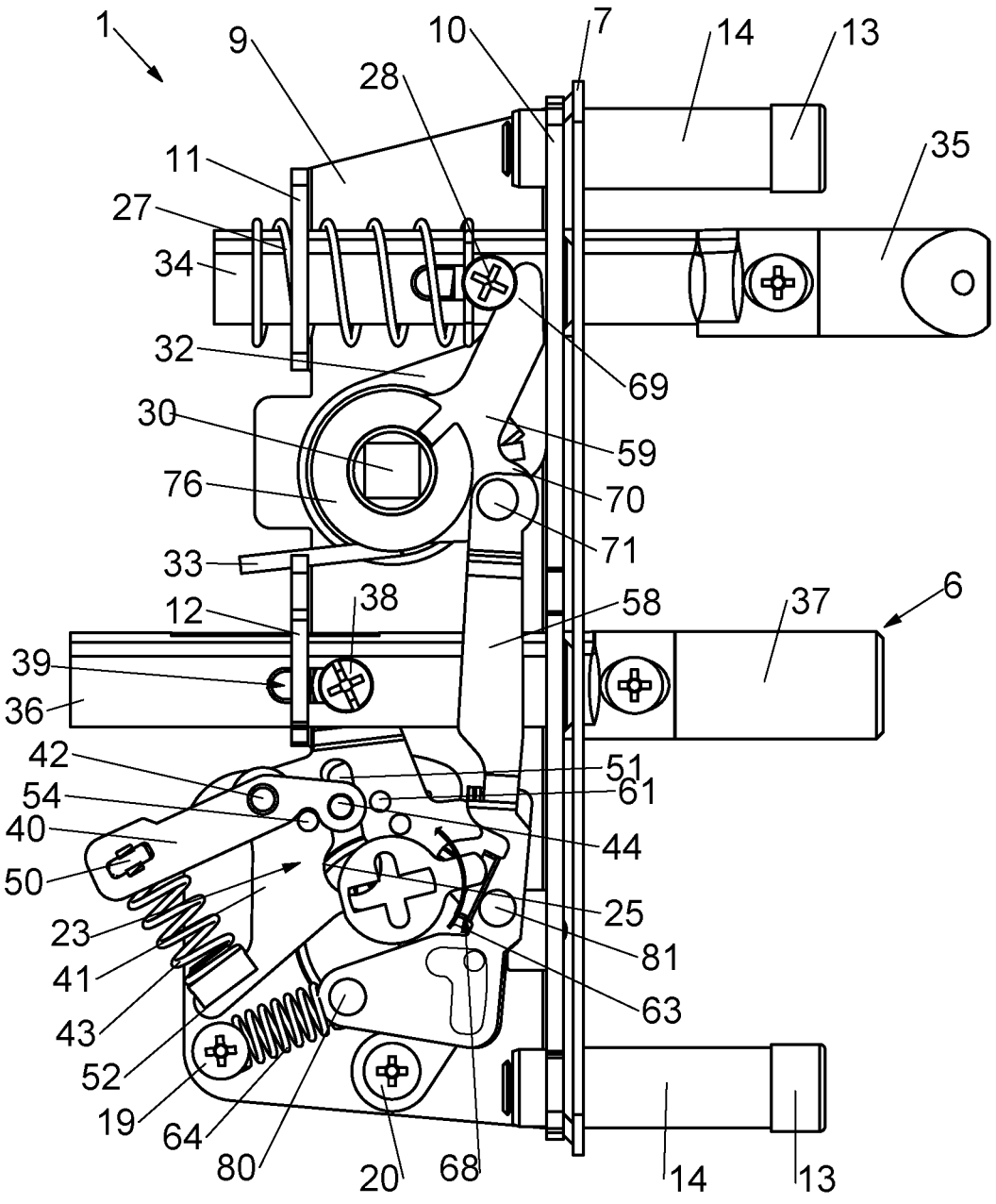
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Fig. 6

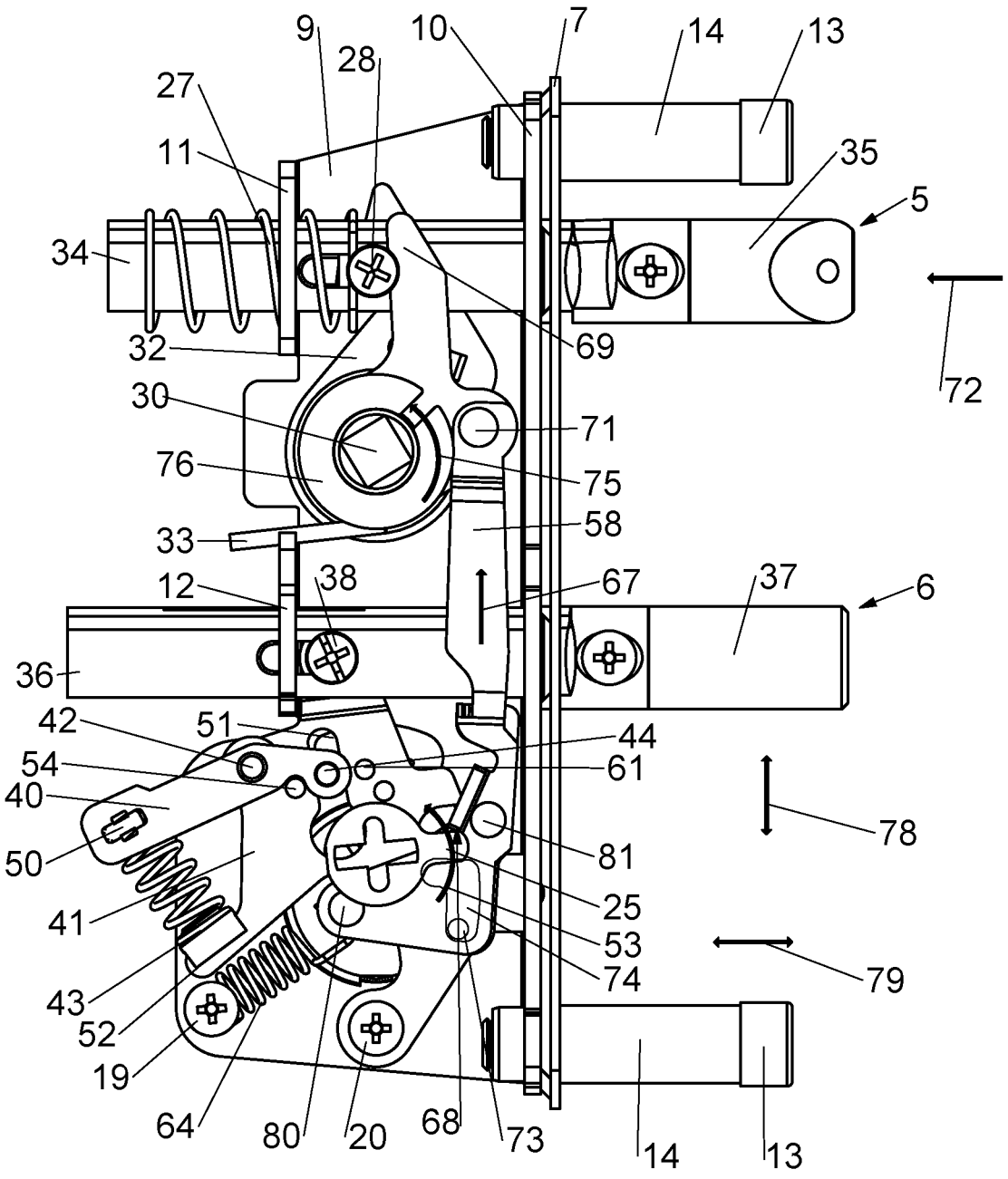
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Fig. 7

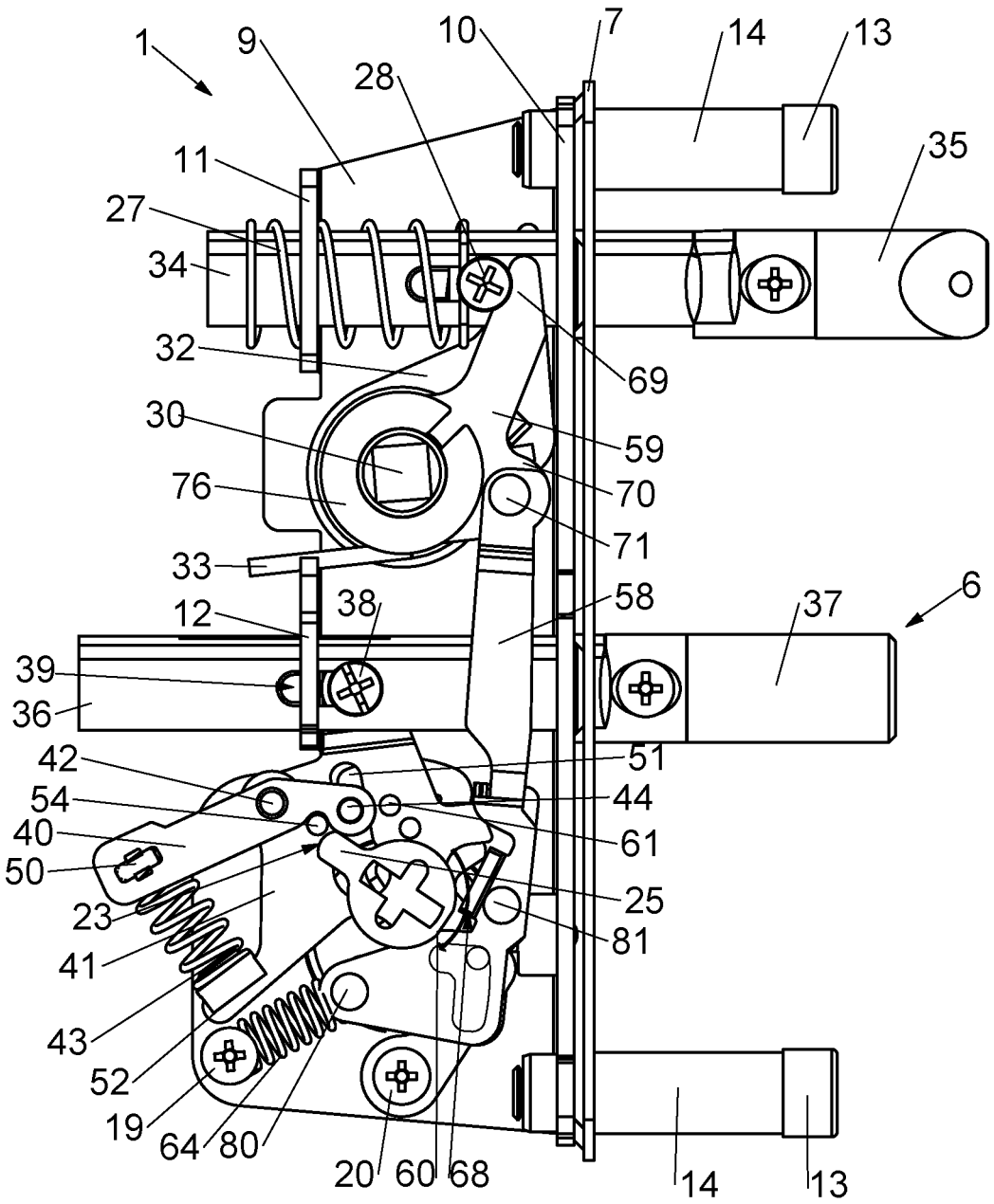
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Fig. 8

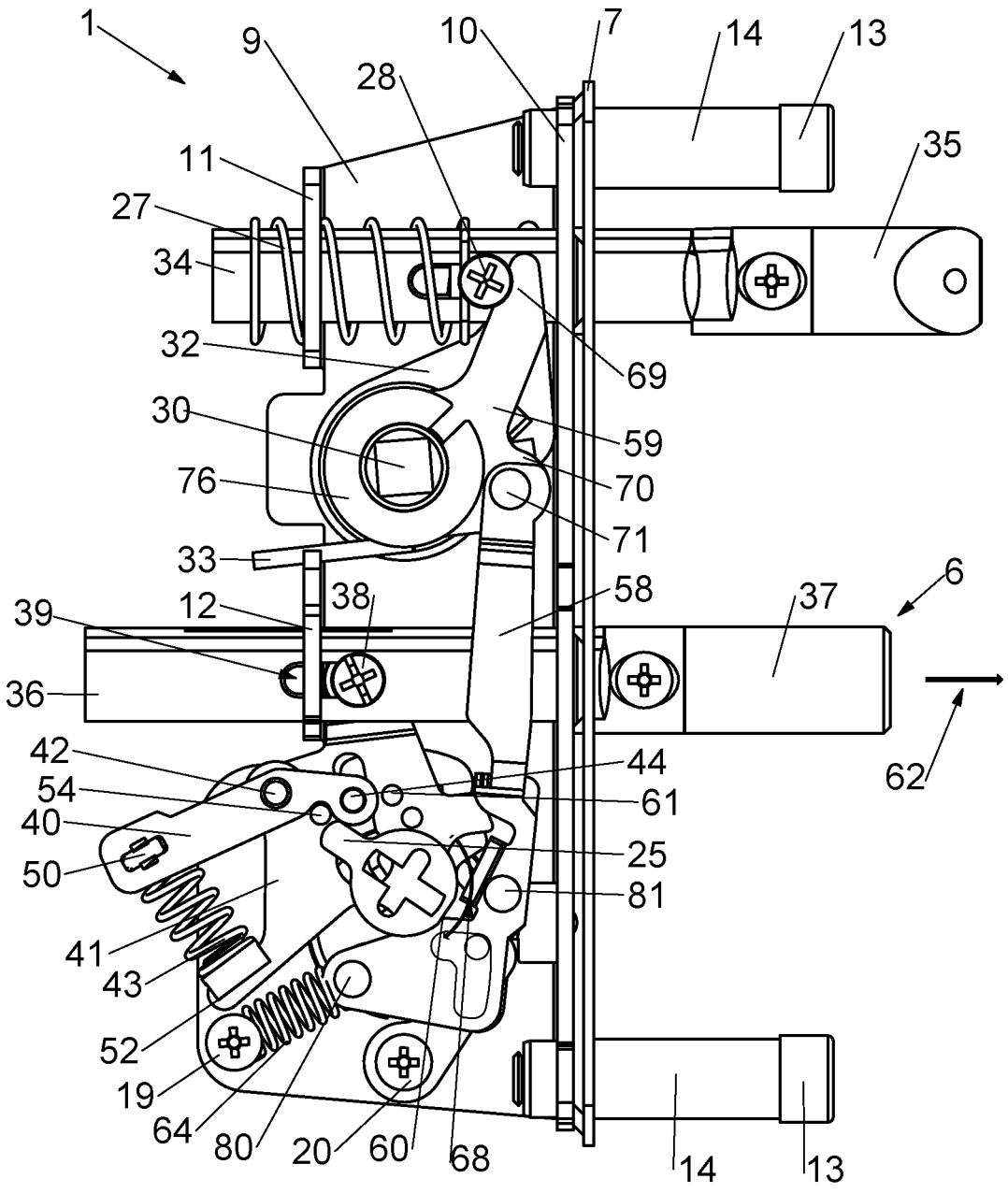
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Fig. 9

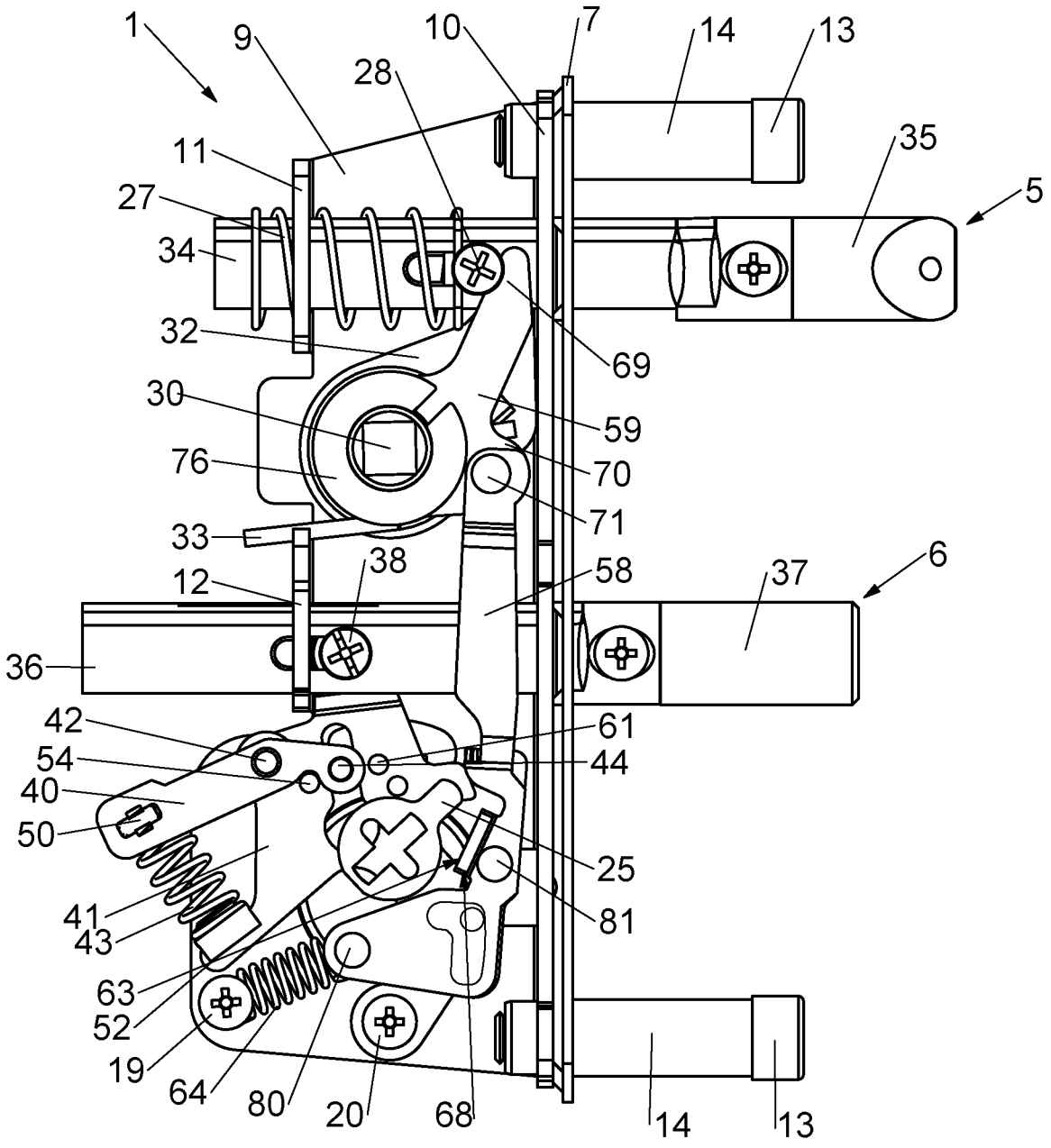
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Fig. 10

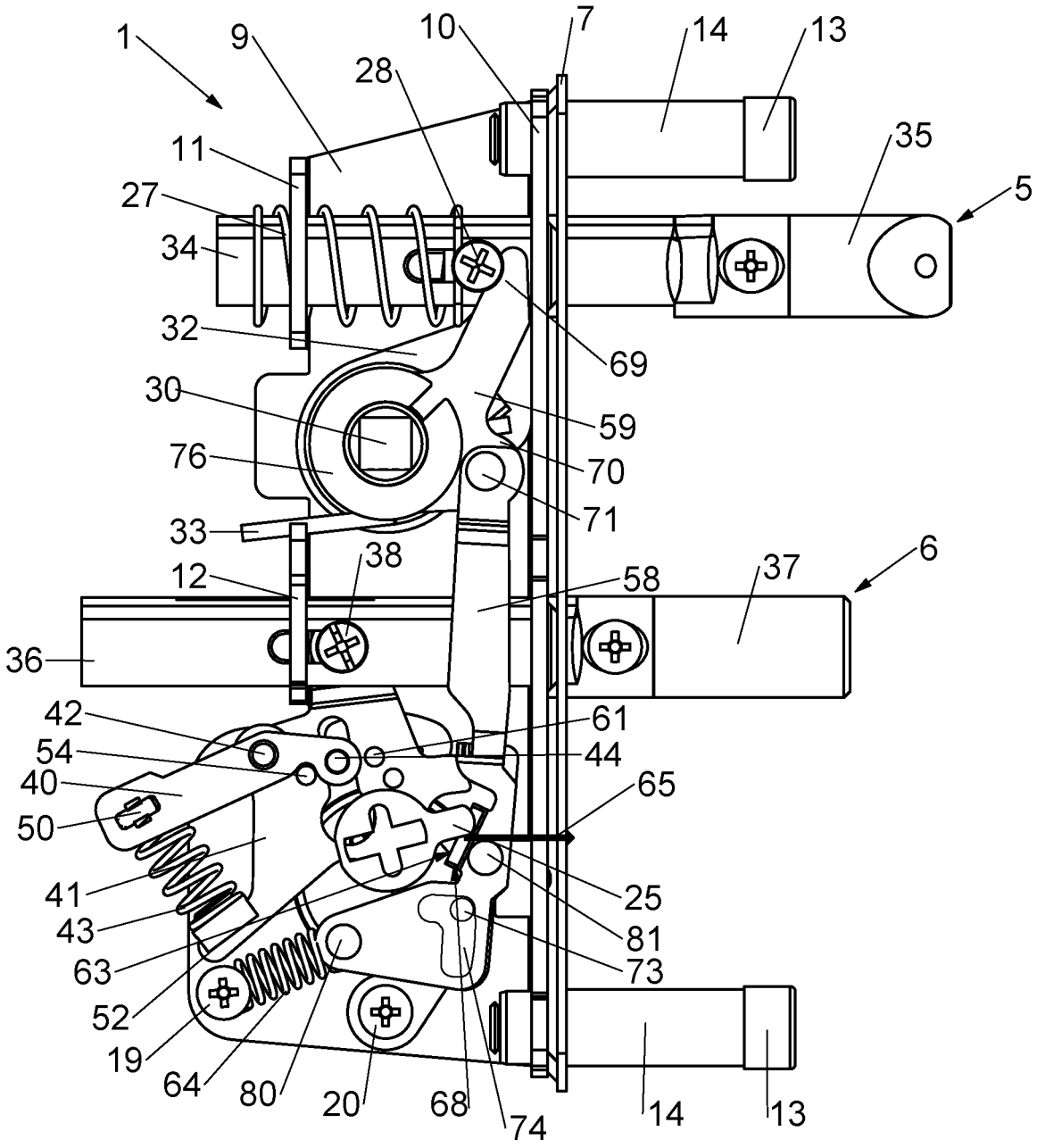
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Fig. 11

LOCK FOR A HINGED CLOSURE MEMBER

BACKGROUND

Locks for a hinged closure member, such as gates, doors and fences are known. A first type of locks relies on the use of two individual key actuated cylinders to operate the lock from either side of the hinged closure member. Such a lock is disclosed in U.S. Pat. No. 7,497,486 and US-A-2010/0263418. These locks have a dead bolt and a latch bolt, both operable to be moved in a retracted and a projecting position. The dead bolt is operated by a dead bolt lever. The latch bolt is operated by a latch bolt lever which is connected to a handle. The lock further has a key operated cylinder with a rotary driving bit. The rotary driving bit engages the dead bolt lever to move the dead bolt between its retracted and projecting positions. In both of these positions the dead bolt is locked due to the interaction of the dead bolt lever with the dead bolt which both have inclined surfaces that engage one another. Specifically, the free extremity of the dead bolt lever engages with a first inclined surface of the dead bolt when the dead bolt is retracted and with a second inclined surface of the dead bolt when the dead bolt is projected. Due to the inclination of the surfaces, any force exerted onto the dead bolt does not create a torque of the dead bolt lever.

The known locks also have a second turn action, meaning that a second turn of either one of the key actuated cylinders moves the latch bolt into its retracted position. Specifically, upon the first turn of either one of the key actuated cylinders, the rotation of the dead bolt lever also results in a tilting of a second turn latch bolt driver such that one end thereof is moved into the circular path of the rotary driving bit on the key actuated cylinders. Due to this tilt, the rotary driving bit will, upon a second turn of either one of the key actuated cylinders, engage with the second turn latch bolt driver to move the latch bolt by operation of the key of the key actuated cylinder.

A drawback of the locks disclosed in U.S. Pat. No. 7,497,486 and US-A-2010/0263418 is that they cannot be mounted on the post of a gate with the latch bolt and the dead bolt extending entirely through the post. The bolts indeed do not have a sufficient length. Moreover, the mounting mechanisms used to mount the bolts on the lock frame are not strong enough to handle the increased forces that the bolts may be subjected to when they are fully extended. Specifically, when the bolts are fully extended and are subjected to a lateral force, the torque exerted onto the mounting mechanisms of the bolts increases with the length of the bolts.

A further inconvenience with locks of this type is that the stroke of the dead lock, or in other words the distance over which the dead lock is moved when going from its projecting position to its retracted position or vice versa, is determined by the length of the dead bolt lever and the available depth of the hole in the door wherein the lock is to be mounted. Consequently, the stroke of the dead bolt is limited and may not be sufficient in certain outdoor applications where a larger stroke is preferred. Indeed, in case of gates or fences, the lock catcher is usually fixed to a pole placed in a hole in the ground. Although this hole is usually filled with concrete, the pole may move somewhat, especially after some time under the influence of frost or moisture or when a force is exerted thereon for example by a burglar who tries to force the pole away from the lock. It will be clear that the larger the stroke of the dead bolt, the more difficult it will be to withdraw the dead bolt from the lock catcher by removing the pole from the gate or fence.

SUMMARY

This summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This summary is not intended to identify key features of the claimed subject matter, nor is it intended to be used as an aid in determining the scope of the claimed subject matter.

In order to achieve a larger stroke, it is already known to provide a two-turn lock, which requires two turns of the key in order to project the dead bolt over its maximum distance out of the lock. However, turning the key two times is a cumbersome operation so that in practice, the key will often only be turned once.

A solution to this problem for a second type of locks was disclosed in EP-B-1118739. Locks of this second type rely on the use of a single key actuated cylinder that extends through the lock in order to be operable from both sides. The lock disclosed in EP-B-1118739 has a dead bolt and a latch bolt, both operable to be moved in a retracted and a projecting position. The dead bolt is operated by a dead bolt lever. The latch bolt is operated by a latch bolt lever which is connected to a handle. The lock further has a key operated cylinder with a rotary driving bit. The rotary driving bit engages the dead bolt lever to move the dead bolt between its retracted and projecting positions. In both of these positions the dead bolt is locked by means of locking plate which can be moved upwards, against the action of a spring, by means of the rotary driving bit to unlock the dead bolt just before it is displaced by means of the rotary driving bit. The lock further has a second turn latch bolt lever rotatably mounted on the frame of the lock to move the latch bolt from its projecting position to its retracted position and a second turn latch bolt driver pivotally connected between the second turn latch bolt lever and slidably to the dead bolt lever to rotate the second turn latch bolt lever. The rotary driving bit is engaging the second turn latch bolt driver to move the latch bolt by operation of the key of the key actuated cylinder.

A problem with this known lock is that when the dead bolt is undergoing a lot of resistance during operation towards the projecting position of the dead bolt, the rotary driving bit and dead bolt lever may be forced into a relative positioning wherein it is no longer possible to rotate the dead bolt lever with the rotary driving bit. In particular, the rotary driving bit may get stuck between the free extremity of the dead bolt lever and the actuation portion of the second turn latch bolt driver when the dead bolt is not correctly locked by the locking means of the lock and is pushed into its retracted position again by a resilient force exerted onto the dead bolt during locking. Alternatively, the rotary driving bit may have passed the actuation portion of the second turn latch bolt driver during a second turn when opening the lock. In those situations the dead bolt cannot be moved anymore and the lock is blocked. An intervention of a technician is needed to unlock the blocked lock.

This problem has already been addressed in the lock disclosed in EP-B-2915939. EP-B-2915939 proposes to solve this problem by providing an auxiliary engagement portion on the dead bolt for engaging the rotary driving bit when said rotary driving bit is rotated in the locking direction.

An inconvenience of the locks disclosed in EP-B-1118739 and EP-B-2915939 is that they operate using a single key

actuated cylinder having a centrally placed rotary driving bit which can directly act on both the dead bolt lever and the locking plate. In other words, they cannot be provided with two independent lock cylinders, which is however the common practice in some countries, for example in the United States of America. On the other hand, the locks disclosed in U.S. Pat. No. 7,497,486 and US-A-2010/0263418 have rotary driving bits which are located near the sides of the lock. Consequently, there is no straightforward way to integrate the desired features of the locks disclosed in EP-B-1118739 and EP-B-2915939 into the locks disclosed in U.S. Pat. No. 7,497,486 and US-A-2010/0263418 due to, among others, different locations where forces are exerted by rotary driving bits and different objects onto which these need to be exerted.

The present disclosure relates to a lock for a hinged closure member, in particular a gate or door, and more particular to a safety lock for outside gates, doors or fences which allow to open the gate or door with a key.

According to a first aspect of the disclosure, there is provided a lock for a hinged closure member. The lock comprises: a frame; a dead bolt slidably mounted on the frame between a retracted position and a projecting position; a dead bolt lever which is in particular pivotally connected to the dead bolt and which is pivotally mounted on the frame between a first angular position, wherein the dead bolt is in its retracted position, and a second angular position, wherein the dead bolt is in its projecting position; a first mounting means on a first face of the lock provided for mounting a first key actuated cylinder having a first rotary driving bit on the frame; a second mounting means on a second face, opposite said first face, of the lock provided for mounting a second key actuated cylinder having a second rotary driving bit on the frame, wherein each rotary driving bit is rotatable upon actuation of the respective key actuated cylinder along a locking direction and an unlocking direction, opposite to said locking direction, each rotary driving bit being arranged to be rotated in said unlocking direction to act upon a respective first actuation element provided on the dead bolt lever to pivot the dead bolt lever from its second into its first angular position and to be rotated in said locking direction to act upon a respective second actuation element provided on the dead bolt lever to pivot the dead bolt lever from its first into its second angular position, wherein the first actuation elements are provided on opposite sides of the dead bolt lever and wherein the second actuations elements are provided on opposite sides of the dead bolt lever; and a locking mechanism arranged to lock the dead bolt in its retracted and its projected position. The locking mechanism comprises: a spring biased lever mounted on the dead bolt lever and having a locking member; a first catch provided on the frame; and a second catch provided on the frame, wherein said locking member is urged by said spring biased lever in said first catch when the dead bolt lever is in its first angular position to lock the dead bolt lever and thereby said dead bolt in its retracted position and wherein said locking member is urged by said spring biased lever in said second catch when the dead bolt lever is in its second angular position to lock the dead bolt lever and thereby said dead bolt in its projecting position, wherein each rotary driving bit is arranged to, when the rotary driving bit is being rotated in said locking direction, act upon said locking member before the rotary driving bit acts upon its respective second actuation element on the dead bolt lever to move said locking member out of said first catch to unlock said dead bolt from its retracted position and to, when the rotary driving bit is being rotated in said unlocking direction, act upon said locking member before the rotary driving bit acts upon its respective first actuation element on the dead bolt lever to move said locking member out of said second catch to unlock said dead bolt from its projecting position.

By providing a locking mechanism that is mounted onto the dead bolt lever, and is thus moving therewith, it is possible to actuate the locking mechanism from both sides of the dead bolt lever. Especially, each rotary driving bit acts directly upon its own side of the locking member. This avoids side-effects, such as torque, that occur when the movement of one of the rotary driving bits would be transferred transversally through the lock to act upon a locking member that is only located on a single side of the dead bolt lever, which is the case with the locking plate of the locks disclosed in EP-B-1118739 and EP-B-2915939.

Furthermore, by providing a locking mechanism which does not require a specific interaction of a free extremity of the dead bolt lever with the dead bolt as in the locks disclosed in U.S. Pat. No. 7,497,486 and US-A-2010/0263418, there are fewer limitations on the size of the dead bolt lever.

Moreover, by providing the locking mechanism on both sides of the dead bolt lever, the central area within the lock is kept relatively free. Consequently, a dead bolt lever as used in EP-B-1118739 and EP-B-2915939 may be used.

In an embodiment of the disclosure, the spring biased lever is pivotally mounted on the dead bolt lever by means of a pivot and comprises a first end-part on a first side of the pivot and a second end-part on a second side of the pivot, opposite the first side, wherein the locking mechanism comprises a spring having a first end connected to the dead bolt lever and a second end connected to the second end-part of the spring biased lever, and wherein the locking member is provided on the first end-part of the spring biased lever.

A pivotal connection between the dead bolt lever and the spring biased lever is very sturdy and enables the provision of a strong spring to urge the locking member into either one of the catches. It also allows the rotary driving bits to exert relatively large forces onto the spring biased lever without deforming this lever or its pivot axis. In particular, this construction is relatively compact, especially when compared to a leaf spring with a similar strength.

Preferably, the spring biased lever comprises two arms on opposite sides of the dead bolt lever, each arm being pivotally mounted on the dead bolt lever, said two arms being connected by the locking member on the first end-part of the spring biased lever. Advantageously, said two arms are further connected by a transverse connection provided on the second end-part of the spring biased lever, said second end of the spring being fixed to the transverse connection.

The provision of two arms alleviates possible effects of torque, for example generated by the action of a rotary driving bit on the locking member, which locking member is preferably centrally slidably connected to the dead bolt lever. This is further improved by providing one or more additional transverse connections. Moreover, connecting the spring to a transverse connection enables a central placement of the spring with respect to the locking member.

In an embodiment of the disclosure, the dead bolt lever is pivoted about a pivot with respect to the frame and connects with the dead bolt on a first distance from said pivot to move the dead bolt from its retracted to its projecting position or vice versa, each of said rotary driving bits engaging the first and the second actuation elements on the dead bolt lever on a second distance from said pivot, which second distance is smaller than said first distance.

In this embodiment, the rotational motion of either one of the rotary driving bits is converted into the translational motion of the dead bolt through the intermediary of the dead bolt lever. Since the driving bit engages the dead bolt lever on a smaller distance from the pivot of this lever than the distance between this pivot and the location where the lever engages the dead bolt, a lever effect is obtained resulting in a larger displacement of the dead bolt upon one turn of the rotary driving bit.

Furthermore, by the rotational motion of the dead bolt lever around its pivot, the part thereof where either one of the driving bits engages the lever does not follow a straight line, rather it follows a curved line. As a result of this rotational motion, the driving bit may engage the dead bolt lever over a longer part of its rotational motion also resulting in an increased stroke of the dead bolt.

In an embodiment of the disclosure, said first catch and said second catch are provided on the first face of the lock and the locking mechanism comprises a further first catch and a further second catch provided on the frame on the second face of the lock, wherein said locking member is urged by said spring biased lever in said further first catch when the dead bolt lever is in its first angular position to lock the dead bolt lever and thereby said dead bolt in its retracted position and wherein said locking member is urged by said spring biased lever in said further second catch when the dead bolt lever is in its second angular position to lock the dead bolt lever and thereby said dead bolt in its projecting position. Advantageously, the locking member is formed by a transverse pin extending through the dead bolt lever and having a first end cooperating with said first catch and said second catch, which transverse pin further has a second end, opposite the first end, cooperating with said further first catch and said further second catch.

By providing two sets of catches on opposite faces of the lock, possible effects of torque, for example generated by the action of a rotary driving bit on the locking member, which locking member is centrally connected to the dead bolt lever, are alleviated as the locking member is guided at two distinct locations. This is especially the case when the end regions of the locking member are cooperating with the catches.

In an embodiment of the disclosure, said first catch and said second catch is formed by a slot in the frame. Preferably, said slot comprises a portion, which is preferably substantially circularly shaped, and which connects said first catch and said second catch. It has been found that such a slot aids in guiding the locking member, especially during rotation of the dead bolt lever.

In an embodiment of the disclosure, said dead bolt is guided in the frame by at least two openings therein which are coaxially aligned such that said dead bolt in its retracted position projects at least 3 cm from said lock.

By guiding the dead bolt through two coaxially aligned openings in the frame, a sufficiently strong mounting mechanism between the dead bolt and the frame is provided in order to withstand the increased forces that the dead bolt may be subjected to when it is fully extended in case the dead bolt is designed to extend entirely through the post as with the locks disclosed in EP-B-1118739 and EP-B-2915939.

According to a first aspect of the disclosure, there is provided a lock for a hinged closure member. The lock comprises: a frame having a front plate; a dead bolt slidably mounted on the frame between a retracted position and a projecting position, which dead bolt protrudes through said front plate out of the lock; a dead bolt lever which engages the dead bolt and which is pivotally mounted on the frame between a first angular position, wherein the dead bolt is in its retracted position, and a second angular position, wherein the dead bolt is in its projecting position; a latch bolt slidably mounted on the frame between a retracted position and a projecting position and urged to its projecting position by a latch bolt spring, which latch bolt protrudes through said front plate out of the lock; a second turn latch bolt lever pivotally mounted on the frame and cooperating with the latch bolt to move the latch bolt from its projecting position to its retracted position against the latch bolt spring upon rotation in a first rotational direction; a second turn latch bolt driver having a distal end which is pivotally mounted on said second turn latch bolt lever and a proximal end which is slidably connected to the dead bolt lever, the proximal end of the second turn latch bolt driver having reciprocal movement in at least a first direction and in a second direction wherein it moves substantially away from and towards said front plate, the second turn latch bolt driver being arranged to rotate the second turn latch bolt lever in said first rotational direction when being moved in said first direction substantially along said front plate; and mounting means provided for mounting a key actuated cylinder on the frame, the key actuated cylinder being provided with a rotary driving bit rotatable upon actuation of said key actuated cylinder and having a free extremity arranged to travel along a circular path along a locking direction and an unlocking direction, opposite to said locking direction, upon actuation of said key actuated cylinder, the rotary driving bit being arranged to be rotated in said unlocking direction to act upon a first actuation element provided on the dead bolt lever to pivot the dead bolt lever from its second into its first angular position and to be rotated in said locking direction to act upon a second actuation element provided on the dead bolt lever to pivot the dead bolt lever from its first into its second angular position. The second turn latch bolt driver comprises a second turn actuation portion, the rotary driving bit being further arranged to, when said rotary driving bit is rotated in said unlocking direction with the dead bolt lever in its first angular position, act upon said second turn actuation portion to move the second turn latch bolt driver in said first direction to rotate the second turn latch bolt lever in said first rotational direction. The lock further comprises a spring acting upon the second turn latch bolt driver to urge the second turn actuation portion in said second direction towards said circular path of said free extremity. The second turn latch bolt driver further comprises a follower portion, the rotary driving bit being further arranged to, when said rotary driving bit has passed said second actuation element in said locking direction without the dead bolt lever being moved into said second angular position and when the rotary driving bit is rotated further in said locking direction, engage said follower portion to move the second turn actuation portion in said second direction out of said circular path against said spring.

This lock provides an alternative, with respect to EP-B-2915939, way to improve the reliability of the lock disclosed in EP-B-1118739. Specifically, by having the follower portion arranged to move the second turn actuation portion in said second direction out of the circular path of the rotary driving bit, the lock can never get blocked in a position wherein the dead bolt is not in the projecting position and the rotary driving bit has passed the second actuation element or in a position wherein the dead bolt is in its retracted position when the rotary driving bit has passed the second turn actuation portion. If the lock gets in the latter position in the embodiment of the disclosure, the rotary driving bit can be rotated in the locking direction to engage the follower

portion of the second turn latch bolt driver to move the second turn actuation portion out of the path of the free extremity of the rotary driving bit, thereby releasing the rotary driving bit from its blocked position. Upon further rotation in the locking direction, the rotary driving bit will reengage with the dead bolt lever, while, upon rotation in the unlocking direction, the rotary driving bit will reengage with the second turn actuation portion.

In an embodiment of the disclosure, the slidable connection between the proximal end of the second turn latch bolt driver and the dead bolt lever comprises a protrusion cooperating with a slot. Preferably, the slot is L-shaped.

A protrusion-slot connection is easy to manufacture, reliable and compact. Moreover, the L-shape of the slot limits undesired motions of the second turn latch bolt driver and the dead bolt lever with respect to one another as much as possible.

As an example of the protrusion-slot connection, the slot is provided on the proximal end of the second turn latch bolt driver and the protrusion is provided on the dead bolt lever.

In a preferred embodiment of the disclosure, when the dead bolt lever is rotated from its first angular position to its second angular position, the protrusion urges against a side of the slot to move the second turn latch bolt driver, against said spring, out of the circular path of the rotary driving bit.

Consequently, when the lock is closed, actuation of the cylinder cannot result in contact with the second turn latch bolt driver. There is thus no risk of operating the latch bolt with the key actuated cylinder as long as the dead bolt remains in its projecting position.

In an embodiment of the disclosure, said spring is fixed on one end to the proximal end of the second turn latch bolt driver and on the other end to the frame.

In an embodiment of the disclosure, said first rotational direction is the same as said unlocking direction.

In an embodiment of the disclosure, the second turn latch bolt driver comprises a protrusion having a front face and an end face, said follower portion being formed by the front face and said second turn actuation portion being formed by the end face.

By having a protrusion performing a double functionality, a compact structure is obtained.

In an embodiment of the disclosure, the lock comprises further mounting means provided for mounting a further key actuated cylinder on the frame, the further mounting means being provided on an opposite face of the lock with respect to the mounting means, the further key actuated cylinder being provided with a further rotary driving bit rotatable upon actuation of said further key actuated cylinder and having a further free extremity arranged to travel along a further circular path along the locking direction and the unlocking direction upon actuation of said further key actuated cylinder, the further rotary driving bit being arranged to be rotated in said unlocking direction to act upon a further first actuation element provided on the dead bolt lever to pivot the dead bolt lever from its second into its first angular position and to be rotated in said locking direction to act upon a further second actuation element provided on the dead bolt lever to pivot the dead bolt lever from its first into its second angular position, wherein the second turn latch bolt driver comprises a further second turn actuation portion, the further rotary driving bit being further arranged to, when said rotary driving bit is rotated in said unlocking direction with the dead bolt lever in its first angular position, act upon said further second turn actuation portion to move the second turn latch bolt driver in said first direction to rotate the second turn latch bolt lever in said first rotational direction, and wherein said second turn latch bolt driver further comprises a further follower portion, the further rotary driving bit being further arranged to, when said further rotary driving bit has passed said further second actuation element in said locking direction without the dead bolt lever being moved into said second angular position and when the further rotary driving bit is rotated further in said locking direction, engage said further follower portion to move the further second turn actuation portion in said second direction out of said further circular path against said spring.

In this embodiment, measures have been taken to prevent either one of the rotary driving bits becoming blocked. In particular, the further rotary driving bit can be rotated in the locking direction to engage the further follower portion of the second turn latch bolt driver to move the further second turn actuation portion out of the path of the free extremity of the further rotary driving bit, thereby releasing the further rotary driving bit from its blocked position. Upon further rotation in the locking direction, the further rotary driving bit will reengage with the dead bolt lever, while, upon rotation in the unlocking direction, the further rotary driving bit will reengage with the further second turn actuation portion.

In a preferred embodiment of the disclosure, the second turn actuation portion and the follower portion are formed on a first part of the second turn latch bolt driver and the further second turn actuation portion and the further follower portion are formed on a second part of the second turn latch bolt driver, said first part and said second part being located on opposite sides of the dead bolt lever and being connected with a transverse connection. Preferably, said spring is fixed on one end to said transverse connection and on the other end to the frame.

As such, the dead bolt lever is relatively free to between the two parts of the second turn latch bolt driver. Moreover, the spring can be centrally placed with respect to both parts of the second turn latch bolt driver.

DESCRIPTION OF THE DRAWINGS

The foregoing aspects and many of the attendant advantages of the present disclosure will become more readily appreciated as the same become better understood by reference to the following detailed description, when taken in conjunction with the accompanying drawings, wherein:

FIG. **1** shows the interior of a lock according to an embodiment of the disclosure mounted on a gate.

FIG. **2** shows an exploded view of certain inner parts of the lock illustrated in FIG. **1** and of a portion of the tubular profile of a gate onto which the lock is mounted.

FIG. **3** shows a side view of the main inner parts of the lock as shown in FIGS. **1** and **2** in the projecting positions of the dead and latch bolt.

FIG. **4** shows a side view of the embodiment of FIG. **3** with the rotary driving bit having been turned in the unlocking direction into an engaging position with the locking member.

FIG. **5** shows the side view of the embodiment of FIG. **4** with the rotary driving bit having been turned further in the unlocking direction into an engaging position with the first actuation element of the dead bolt lever wherein the rotary driving bit has already pushed the locking member to its unlocking position to move the dead bolt from its projecting to its retracted position.

FIG. **6** shows the side view of the embodiment of FIG. **5** with the dead bolt in its retracted position after having turned the rotary driving bit further in the unlocking direction.

FIG. **7** is a same view as FIG. **6** but with the rotary driving bit rotated further in the unlocking direction to engage with the second turn actuation portion to move the second turn latch bolt driver along the first direction to rotate the second turn latch bolt lever in the first rotational direction to move the latch bolt into its retracted position.

FIG. **8** shows the side view of the embodiment of FIG. **3** with the dead bolt in its retracted position with the rotary driving bit rotated in the locking direction into an engaging position with the locking member to unlock the dead bolt from its retracted position.

FIG. **9** shows the side view of the embodiment of FIG. **8** with the rotary driving bit having been rotated in the locking direction into an engaging position with the second actuation element of the dead bolt lever wherein the rotary driving bit has already pushed the locking member to its unlocking position to move the dead bolt from its retracted to its projecting position.

FIG. **10** shows the side view of FIG. **3** with the rotary driving bit having passed the second actuation element without having moved the dead bolt into its projecting position.

FIG. **11** shows the side view of FIG. **10** with the rotary driving bit being rotated further in the locking direction into engagement with the follower portion of the second turn latch bolt driver to move the second turn actuation portion out of the path of the free extremity of the rotary driving bit.

DETAILED DESCRIPTION

Modes for Carrying Out the Disclosure

Throughout this disclosure, the preferred embodiments herein and examples illustrated are provided as examples, rather than as limitations on the scope of the present disclosure. As used herein, the terms "disclosure," "method," "present method" or "present disclosure" refers to any one of the embodiments incorporating features of the disclosure described herein, and any equivalents. Furthermore, reference to various feature(s) of the "disclosure," "method," "present method" or "present disclosure" throughout this document does not mean that all claimed embodiments or methods must include the referenced feature(s).

It is also understood that when an element or feature is referred to as being "on" or "adjacent" another element or feature, it can be directly on or adjacent the other element or feature or intervening elements or features that may also be present. Furthermore, relative terms such as "outer", "above", "lower", "below", and similar terms, may be used herein to describe a relationship of one feature to another. It is understood that these terms are intended to encompass different directions in addition to the direction depicted in the figures.

Although the terms first, second, etc. may be used herein to describe various elements or components, these elements or components should not be limited by these terms. These terms are only used to distinguish one element or component from another element or component. The terms are interchangeable under appropriate circumstances and the embodiments of the disclosure can operate in other sequences than described or illustrated herein. As used herein, the term "and/or" includes any and all combinations of one or more of the associated list items.

The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the disclosure. As used herein, the singular forms "a," "an," and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises," "comprising," "includes" and/or "including" when used herein, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

The present disclosure will be described with respect to particular embodiments and with reference to certain drawings but the disclosure is not limited thereto but only by the claims. The drawings described are only schematic and are non-limiting. In the drawings, the size of some of the elements may be exaggerated and not drawn on scale for illustrative purposes. The dimensions and the relative dimensions do not necessarily correspond to actual reductions to practice of the disclosure.

FIG. **1** shows a lock **1** according to an embodiment of the disclosure. In the illustrated embodiment, the lock **1** is mounted against a profile **2** of a hinged closure member, specifically against a tubular profile of a gate or fence. The profile **2** is provided with holes (not shown) to receive both the latch bolt **5** and the dead bolt **6** there through. In an alternative, non-illustrated embodiment, the lock **1** may be used as a mortise lock and be put into a corresponding mortise in a door which then acts as the hinged closure member.

As used herein, the term "the latch bolt and/or dead bolt is/are in a retracted position" does not necessarily mean that the bolt is retracted within the lock **1** (i.e. meaning behind the front plate **7** of the lock **1**). Instead, when the lock **1** is mounted on a tubular profile **2** as shown in FIG. **1**, the term "the latch bolt and/or dead bolt is/are in a retracted position" means that the bolt is retracted in the corresponding hole of the tubular profile **2** where it is fixed against or that it extends over a small distance out of this profile **2**. On the other hand, when the lock **1** is mounted in a mortise in a door, the term "the latch bolt and/or dead bolt is/are in a retracted position" means that the bolt is retracted within the lock **1**, i.e. behind or at the same level as the front plate **7** of the lock **1**.

As used herein, the term "the latch bolt and/or dead bolt is/are in a projecting position" means, in case the lock **1** is mounted on a tubular profile **2** as shown in FIG. **1**, that the bolt extends over a larger distance out of the profile **2** where it is fixed against. On the other hand, when the lock **1** is mounted in a mortise in a door, the term "the latch bolt and/or dead bolt is/are in a projecting position" means that the bolt is projecting a certain distance from the lock **1**, i.e. projecting from the front plate **7** of the lock. The distance over which the bolt moves between its projecting and retracted positions is called the stroke of the bolt.

A partly exploded view of the lock **1** of the embodiment of FIG. **1** is shown in FIG. **2**. The lock **1** comprises a frame **8** including a base plate **9**, a front plate **7** connected to the base plate **9** and a lower plate **18** connected to the base plate **9**. When mounting the assembly of the base plate **9**, the front plate **7** and the lower plate **18** in a cover box (not shown), the front plate **7** engages against the peripheral edge of the cover box. The base plate **9** has on its front side an upstanding edge **10** and on its back side two upstanding edge portions **11** and **12**. The front plate **7** is connected to the base plate **9** by connecting the front plate **7** to the upstanding edge **10** of the base plate **9**. Two threaded inserts are connected to corresponding holes in the upstanding edge **10** and the front plate **7**. The bottom plate **18** is connected to the base plate **9** by means of two transverse screw connections **19**, **20** and by a threaded insert in a corresponding opening in the upstanding edge **10**. Screws **13** and spacers **14** are provided

to fix the lock laterally to the profile **2** of the hinged closure member as illustrated in FIG. **1**.

In the illustrated embodiments, the lock **1** is provided with two key actuated cylinders **16**, **17** on opposite faces of the lock **1**, each cylinder **16**, **17** being mounted on the frame **8** by means of a threaded connection. Specifically, the first cylinder **16** is provided with a threaded outer surface that is mounted in an inner-threaded opening in the base plate **9**, which inner-threaded opening is provided with an inner threaded surface to match the threaded outer surface of the first cylinder **16**. Similarly, the second cylinder **17** is provided with a threaded outer surface **21** that is mounted in an inner-threaded opening **22** in the bottom plate **18**, which inner-threaded opening **22** is provided with an inner threaded surface to match the threaded outer surface **21** of the second cylinder **17**. The bottom plate **18** thus acts as a cylinder support member for the second cylinder **17**. Each of the cylinders **16**, **17** is also provided with one or more grooves **15** in its outer surface, which grooves **15** are used to lock the cylinder with respect to the frame **8** by means of a threaded insert (not shown). Such cylinders **16**, **17** are commercially available, for example the "1 inch Mortise Cylinder" sold by "All About Doors and Windows". In an advantageous embodiment, the second threaded insert which locks the second cylinder **17** to the bottom plate **18** may also be used be part of the connection between the bottom plate **18** and the base plate **9**.

In an alternative, non-illustrated embodiment, only a single key actuated cylinder **16** is used. This may be the case, for example, when only one face of the lock **1** is required to be actuated by a key. Alternatively, the single key actuated cylinder **16** is a cylinder which extends through the lock **1** and is thus also accessible from both faces of the lock **1**. An example of such a cylinder is a so-called Euro-cylinder corresponding to standard DIN 18252/2006 which is secured to the frame **8** by means of a threaded insert. In this embodiment, the openings in the base plate **9** and the bottom plate **18** do not require a threaded inner surface.

Irrespective of the number of key actuated cylinders, each of these comprises a rotary driving bit **25** which may be rotated around a central axis of the respective cylinder to actuate the lock **1** as described below. Specifically, each rotary driving bit **25** may be rotated in either a locking direction (clockwise in FIGS. **3** to **11**) or an unlocking direction (counter clockwise in FIGS. **3** to **11**). Each rotary driving bit **25** has a free extremity **23** (indicated in FIG. **6**) which, upon actuation of the rotary driving bit, travels along a circular path **26** (indicated by the dashed line in FIG. **3**) in either the locking or unlocking direction.

The lock **1** further comprises a latch bolt **5** which is slidably mounted in the frame **8** by moving in a first corresponding opening in the upstanding edge portion **11** and in a second corresponding opening in the upstanding edge **10** and/or in the front plate **7**. A compression spring **27** is provided over the latch bolt **5** to urge this bolt to its projecting position (shown in FIG. **3**). The compression spring **27** is acting between the upstanding edge portion **11** and slide means **28**, e.g. a screw or pin, on the latch bolt **5**.

The latch bolt **5** may be actuated by means of handles (not shown) to its retracted position to open the hinged closure member. Specifically, a rectangular shaft of the handles is inserted in a corresponding rectangular hole **30** in a follower **31** (indicated in FIG. **2**). This follower **31** is in turn connected to a latch bolt lever **32** which follows the rotation of the handles. The handles are thus used to move the latch bolt lever **32** against the action of a main spring **33** which is a spiral spring positioned around the follower **31**. The main spring **33** pushes the latch bolt lever **32** and thus the follower **31** and the handles to their rest positions. A free extremity of the latch bolt lever **32** engages the slide means **28** on the latch bolt **5**. Consequently, actuation of the handles causes the follower **31** to rotate the latch bolt lever **32** against the action of the main spring **33** while the free extremity of the latch bolt lever acts upon the slide means **28** on the latch bolt **5** to move the latch bolt **5** against the compression spring **27** into its retracted position (shown in FIG. **7**).

The latch bolt **5** in the embodiment of the FIGURES is made of steel, more particularly of stainless steel which is a strong and weather resistant material but is difficult to be shaped in the usual way, e.g. by milling. As will become apparent hereinafter, the latch bolt **5** may indeed have quite a complex shape, especially in order to allow adjusting the length over which it projects out of the lock **1**. The latch bolt **5** has two separate parts, namely a hollow part **34** and a more solid bolt part **35**. The solid bolt part **35** is arranged to project out of the lock **1** into a corresponding lock catcher, preferably a lock catcher as described in EP-A-3239440 which is incorporated in its entirety herein by reference.

In the illustrated embodiments, the solid part **35** is removably mounted into the hollow rod part **34**. In this way, the solid part **35** can be mounted in two positions, namely in a first position wherein the oblique front face is directed in a first direction and in a second position wherein the oblique front face is rotated axially over about 180°. The latch bolt **5** illustrated in the FIGURES as well as an alternative latch bolt is described in EP-B-1118739 which is incorporated in its entirety herein by reference.

The lock further comprises a dead bolt **6** which is slidably mounted on the frame **8** between a projecting position (shown in FIG. **3**) and a retracted position (shown in FIG. **6**). The dead bolt **6** slides in corresponding openings in the upstanding edge **10** and the upstanding edge portion **12** of the base plate **9**. The dead bolt **6** is locked in both positions, i.e. the projecting position and the retracted position, by a locking mechanism that is operable by either one of the key actuated cylinders **16**, **17**.

In the embodiment illustrated in the FIGURES, the dead bolt **6** is made of two portions: a hollow rod part **36** and a bolt part **37**. The hollow rod part **36** extends at least partially in the lock **1**. The bolt part **37** is arranged to cooperate with the lock catcher as described above. In the rod part **36**, slide means **38** are arranged which are guided in slots **39** in the rod part **36** of the dead bolt **6**. The position of the slide means **38** relative to the rod part **36** can be adjusted by means of a known technology, e.g. a set screw (not shown) in the length direction of the rod part **36** and accessible through an axial passageway in the bolt parts **36** and **37**. In this way, the distance over which the dead bolt **6** projects out of the lock **1** can be adjusted.

According to one aspect of the disclosure, the locking mechanism comprises a spring biased lever **40** pivotally mounted on a dead bolt lever **41** which engages the dead bolt **6** as described below. The spring biased lever **40** pivots around pivot **42** which may be formed by protrusions on the dead bolt lever **41**. A first end of the lever **40** is connected to one end of a spring **43**, in particular a compression spring, the opposing end of the spring **43** being fixed to the dead bolt lever **41**, in particular on a protrusion **52** thereof. A second end of the lever **40**, on the opposite side of the pivot **42** as the first end of the lever **40**, acts as locking member **44** and is urged, due to spring **43**, towards the circular path **26** of the free extremity of the rotary driving bit **25**. The locking mechanism further comprises two catches **46**, **47**, preferably formed by a single slot **45** in the frame **8**. Preferably, the

frame **8** comprises two sets of catches **46**, **47**, each set being preferably formed by a single slot **45**, as illustrated in FIG. **2**. In particular, a first one of the slots **45** is formed in the base plate **9**, while a second of the slots is formed in the bottom plate **18**. The locking member **44** is guided within the slot **45** and the spring **43** urges the locking member **44** into catch **46** when the dead bolt **6** is in its retracted position and into catch **47** when the dead bolt **6** is in its projecting position thus locking the dead bolt **6** in one of its two positions, i.e. the projecting position and the retracted position. The use of two slots **45** ensures that both sides of the locking member **44** are guided.

Because lever **40**, with its locking member **44**, is mounted on the dead bolt lever **41**, urging the locking member **44** into one of the catches **46**, **47** not only locks the dead bolt **6** in one of its two positions, i.e. the projecting position and the retracted position, but also locks the dead bolt lever **41** itself, i.e. the dead bolt lever **41** is prevented from being rotated around its pivot.

In a preferred embodiment, the lever **40** has two arms **48**, **49** located on opposite sides of the dead bolt lever **41**. The arms **48**, **49** are connected on the first end of the lever **40** by a transverse plate **50** upon which the spring **43** acts. The arms **48**, **49** are connected on the second end of the lever **40** by a transverse pin which forms the locking member **44**, the ends of the pin being guided in slot(s) **45**. As such, in this embodiment, the locking member **44** extends through the dead bolt lever **41**, meaning that an opening **51** is provided in the dead bolt lever **41** to enable the locking member **44** to move with respect to the dead bolt lever **41**. In the illustrated embodiments, washers **82**, **83** are provided over the transverse pin **44** on either side of the dead bolt lever **41**.

This preferred embodiment is particularly advantageous when the lock **1** comprises two key actuated cylinders **16**, **17**, since the first cylinder **16** acts on arm **48** while the second cylinder **17** acts on arm **49**. Consequently, it is also advantageous to use two slots **45** in this embodiment.

The movement of the dead bolt **6** is controlled by actuating either one of the key actuated cylinders **16**, **17** to cause a rotation of either one of the rotary driving bits **25**, which rotation in turn actuates the dead bolt lever **41** which is pivotally mounted about a pivot formed by the second transverse screw **20** used to fix the lower plate **18** to the base plate **9**. The dead bolt lever **41** may be rotated between a first angular position (shown in FIG. **6**), corresponding to the retracted position of the dead bolt **6**, and a second angular position (shown in FIG. **3**), corresponding to the projecting position of the dead bolt **6**.

As illustrated in FIG. **4**, when the dead bolt **6** is in the projecting position, movement of the rotary driving bit **25** in the locking (i.e. counter clockwise) direction (see arrow **53** on FIG. **4**) results first in engagement of the rotary driving bit **25**, in particular the free extremity **23** thereof, with the locking member **44** so that the locking member **44** is moved out of catch **47**, i.e. out of the circular path **26** of the free extremity of the rotary driving bit **25**, to unlock the dead bolt **6** from its projecting position. Simultaneously, movement of the locking member **44** out of catch **47** enables rotation of the dead bolt lever **41**.

When subsequently the rotation in the unlocking direction **53** is continued as illustrated in FIG. **5**, the rotary driving bit **25** engages a first actuation element **54** on the dead bolt lever **41**, which element **54** is formed by a protrusion from the dead bolt lever **41**. Preferably, the lock **1** comprises two first actuation elements **54**, one on each side of the dead bolt lever **41**, meaning that the rotary driving bit **25** of the respective cylinder **16**, **17** has its own first actuation element **54**.

The dead bolt lever **41** has a protrusion **55** that is connected to the dead bolt **6** such that a rotation of the dead bolt lever **41** about pivot **20** in the unlocking direction **53** results in a translation movement of the dead bolt **6** in the direction of arrow **56** (see FIG. **5**). In particular, the protrusion **55** is provided on a first arm of the dead bolt lever **41**, which first arm extends from the pivot **20** to the dead bolt **6**. In the embodiment of FIGS. **4** to **6**, the first arm of the dead bolt lever **41** is connected to the dead bolt **6** by providing a slot **57** in the dead bolt lever **41** with the slide means **38** being provided in the slot **57** of the dead bolt lever **41**. As illustrated in FIG. **6**, further rotation of the rotary driving bit **25** in the unlocking, counterclockwise direction **53** fully retracts the dead bolt **6**. The spring **43** urges the locking member **44** into catch **46** thereby locking the dead bolt **6** in its retracted position and also the dead bolt lever **41** in its first angular position.

Further rotation of the rotary driving bit **25** in the unlocking direction **53** enables to retract the latch bolt **5** by means of a second turn latch bolt driver **58** and a second turn latch bolt lever **59**, which will be described in more detail below.

When the dead bolt **6** is in the retracted position (illustrated in FIG. **6**) and the rotary driving bit **25** is rotated back in the locking (clockwise in FIGS. **3** to **11**) direction (indicated with arrow **60** in FIG. **8**) as illustrated in FIG. **8**, the rotary driving bit **25**, in particular the free extremity **23** thereof, engages the locking member **44** so that the locking member **44** is moved out of catch **46** and out of the circular path **26** of the free extremity of the rotary driving bit **25**, to unlock the dead bolt **6** from its retracted position. Simultaneously, movement of the locking member **44** out of catch **46** enables rotation of the dead bolt lever **41** and further rotation of the rotary driving bit **25** in the locking direction.

When subsequently the rotation in the locking direction **60** is continued as illustrated in FIG. **9**, the rotary driving bit **25** engages a second actuation element **61** of the dead bolt lever **41**. Because the dead bolt lever **41** is connected with the dead bolt **6** as described above, rotation of the dead bolt lever **41** in the locking direction **60** results in a translation movement of the dead bolt **6** in the direction of arrow **62** (see FIG. **9**). Preferably, the lock **1** comprises two second actuation elements **61**, one on each side of the dead bolt lever **41**, meaning that the rotary driving bit **25** of the respective cylinder **16**, **17** has its own second actuation element **61**.

Further rotation of the rotary driving bit **25** in the locking, counterclockwise direction **60** fully projects the dead bolt **6**. The spring **43** urges the locking member **44** into catch **47** thereby locking the dead bolt **6** in its projecting position and also the dead bolt lever **41** in its second angular position as shown in FIG. **3**.

In some situations, especially when forces are acting on the dead bolt **6** in the opposite direction of the translation movement **62**, the rotary driving bit **25** may pass the second actuation element **61** of the dead bolt lever **44** without the locking member **44** being urged into catch **47**. In such a case, the dead bolt **6** may be moved somewhat back towards its retracted position and may be pushed further towards its retracted position when the rotary driving bit **25** is rotated in the unlocking direction and acts upon the second actuation element **61** (instead of on the first actuation element) so that the locking member **44** will be urged into catch **46**. However, the rotary driving bit **25** is situated on the wrong side of the second actuation element **61** so that it cannot be rotated further in the unlocking direction. This situation is

illustrated in FIG. **10** and it is an aspect of the disclosure to ensure that the rotary driving bit **25** is not permanently stuck in this position, i.e. by being blocked by the second actuation element **61** in the unlocking rotation direction and by being blocked by the second turn latch bolt driver **58** in the locking rotation direction.

According to this aspect of the disclosure, as illustrated in FIG. **11**, when the rotary driving bit **25** is further rotated in the locking direction **60**, the rotary driving bit **25** engages a follower portion **63** on the second turn latch bolt driver **58**. The follower portion **63** is formed by a surface of a protrusion **77** (indicated in FIG. **2**) of the second turn latch bolt driver **58**. This follower portion **63** is urged into the circular path **26** of the free extremity of the rotary driving bit **25** due to a spring **64** which is connected at its first end to the second turn latch bolt driver **58** and at its second end to the frame **8** via the first transverse screw connection **19** between the base plate **9** and the lower plate **18**. Alternatively, the spring **64** at its second end may be connected to the dead bolt lever **41**. Rotation of the rotary driving bit **25** in the locking direction pushes the follower portion **63** out of the circular path **25**, i.e. the follower portion **63** moves towards the front plate **7** (see arrow **65** in FIG. **11**). This outward, i.e. radially away from the circular path **26**, allows the rotary driving bit **25** to pass by the follower portion **63** upon rotation of in the locking direction **60**. Once passed the follower portion **63**, the rotary driving bit **25** can be rotated further in the locking direction **60** until it re-engages with the locking member **44** as shown in FIG. **8** while the spring **64** urges the follower portion **63** back into the circular path **26**.

The dead bolt **6** has only two extreme positions (apart from the fact that the distance over which it projects out of the lock can be adjusted), namely a projecting position, illustrated in FIG. **3**, and a retracted position, illustrated in FIG. **6**. These two extreme positions correspond respectively to the second and the first angular positions of the dead bolt lever **41** as described above. In the second angular position of the dead bolt lever **41**, a stop portion of the dead bolt lever **41**, more particularly a projection **66** on the dead bolt lever **41**, engages a stop on the frame **8**, more particularly the front plate **7** (through a slot in the upstanding edge **10**, which has not been shown), so that the dead bolt lever **41** cannot rotate any further.

In the illustrated embodiments, the cylinder(s) **16**, **17** is/are provided between the dead bolt **6** and the pivot **20**. The pivot **20** is so positioned that the dead bolt lever **41** engages the dead bolt **6** on a first distance from the pivot **20** and the rotary driving bit **25** engages the dead bolt lever **41** (meaning the first or second actuation element **54**, **61**) on a second distance from the pivot **20** with the second distance in each position of the dead bolt lever **41** being smaller than the first distance. This ensures an increased stroke of the dead bolt **6** as explained in EP-B-1118739.

Referring to FIG. **7**, the lock **1** comprises a second turn latch bolt driver **58**. The second turn latch bolt driver **58** is at its one end slidably connected to the dead bolt lever **41**. The slidable connection between the dead bolt lever **41** and the second turn latch bolt driver **58** operates in two distinct directions. Specifically, a first direction (indicated with arrow **78** in FIG. **7**) allowing the second turn latch bolt driver **58** to move substantially along the front plate **7** and a second direction (indicated with arrow **79** in FIG. **7**) to move the second turn latch bolt driver **58** entirely out of the circular path **26** and at least partly into the circular path **26** by moving substantially away from and towards the front plate **7**. As described above, the spring **64** already urges the second turn latch bolt driver **58** at least partly into the circular path **26**, in particular the follower portion **63** thereof.

Specifically, in the first angular position of the dead bolt lever **41**, i.e. in the position as illustrated in FIG. **7**, wherein the dead bolt **6** is locked in its retracted position, a second turn actuation portion **68** of the second turn latch bolt driver **58** is in the circular path **26** of the free extremity **26** of the rotary driving bit **14**. Consequently, upon rotation of the rotary driving bit **25** in the unlocking direction, with the dead bolt in its retracted position, the rotary driving bit **25** engages with the second turn actuation portion **68** of the second turn latch bolt driver **58** as shown in FIG. **7**.

The second turn latch bolt driver **58** is at its other end connected to the second turn latch bolt lever **59** arranged to move the latch bolt **5** against the action of the compression spring **27** from its projecting position to its retracted position. The second turn latch bolt lever **59** is rotatable arranged over the follower **31** and is covered by a washer **76**. The second turn latch bolt lever **59** has a first lever arm **69** to engage the sliding means **28** on the latch bolt **5** and a second lever arm **70** to pivotally connect with the second turn latch bolt driver **58** about pivot **71**.

When in the position of FIG. **6**, thus after moving the dead bolt **6** from the projecting to the retracted position by rotating the rotary driving bit **25** in the unlocking direction **53**, further rotation of the rotary driving bit **25** in the unlocking direction **53** (i.e. a second turn in the unlocking direction) engages the rotary driving bit **25** with the second turn actuation portion **68** of the second turn latch bolt driver **58**. This actuation causes a translational movement of the second turn latch bolt driver **58** indicated with arrow **67** in FIG. **7**. This translational movement of the second turn latch bolt driver **58** in turn rotates the second turn latch bolt lever **59** in a first rotational direction indicated with arrow **75** in FIG. **7**, which rotation causes a retraction of the latch bolt **5** as indicated with arrow **72** in FIG. **7**.

In the illustrated embodiments, the second turn actuation portion **68** is formed by a face of protrusion **77** on the second turn latch bolt driver **58**, which protrusion **77** also has a face acting as the follower portion **63**.

When the lock **1** comprises two key actuated cylinder **16**, **17**, a second turn actuation portion **68** and a follower portion **63** have to be provided for each rotary driving bit **25**. Consequently, there needs to be a second turn actuation portion **68** and a follower portion **63** on each side of the dead bolt lever **41**. In the illustrated embodiments, this is achieved by having a two-fold structure for the bottom part of the second turn latch bolt driver **58** (see in particular FIG. **2**). Specifically, the bottom part of the second turn latch bolt driver **58** is partly located on each side of the dead bolt lever **41**. Transverse connections **80**, **81** connect both parts of the bottom part of the second turn latch bolt driver **58** with one another ensuring that the entire second turn latch bolt driver **58** moves as a whole. Advantageously, one of the transverse connections **80** may also be used to anchor one end of spring **64**.

The slidable connection between the dead bolt lever **41** and the second turn latch bolt driver **58** is preferably a protrusion-slot connection. Specifically, a protrusion **73** is provided on the dead bolt lever **41** cooperates with a slot **74** in the second turn latch bolt driver **58**. The boundaries of the slot **74** act as a stop for possible movements of the second turn latch bolt driver **58**. Specifically, the protrusion-slot connection limits the movement of the second turn latch bolt driver **58** along the first direction **67**. In this way, there is no risk that the rotary driving bit **25** could pass the second turn

actuation portion **68** when it would be rotated too far in the unlocking direction **60**. If desired, the protrusion-slot connection may be replicated on both sides of the dead bolt lever **41**.

Moreover, the protrusion-slot connection also influences the movement of the second turn latch bolt driver **58** along the second direction **79**. In particular, as illustrated in FIG. **3**, in the second angular position of the dead bolt lever **41**, i.e. with the dead bolt **6** in its projecting position, protrusion **73** acts upon a side of the slot **74** to move the second turn latch bolt driver **58** entirely out of the circular path **26**. Consequently, there is no risk that, when the dead bolt **6** is in its projecting position, rotation of the cylinder(s) **16**, **17** could result in engagement of the second turn latch bolt driver **58** which could lead to movement of the latch bolt **5**.

In the illustrated embodiments, the slot **74** is L-shaped with a first leg oriented along the first direction **78** and a second leg oriented along the second direction **79**. However, other shapes would be equally suitable.

Although the present disclosure has been described in detail with reference to certain preferred configurations thereof, other versions are possible. Embodiments of the present disclosure can comprise any combination of compatible features shown in the various figures, and these embodiments should not be limited to those expressly illustrated and discussed. Therefore, the spirit and scope of the disclosure should not be limited to the versions described above.

The foregoing is intended to cover all modifications and alternative constructions falling within the spirit and scope of the disclosure as expressed in the appended claims, wherein no portion of the disclosure is intended, expressly or implicitly, to be dedicated to the public domain if not set forth in the claims.

While illustrative embodiments have been illustrated and described, it will be appreciated that various changes can be made therein without departing from the spirit and scope of the disclosure.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A lock for a hinged closure member, the lock comprising:

a frame;

a dead bolt slidably mounted on the frame between a retracted position and a projecting position;

a dead bolt lever which is connected to the dead bolt and which is pivotally mounted on the frame between a first angular position, wherein the dead bolt is in its retracted position, and a second angular position, wherein the dead bolt is in its projecting position;

a first mounting means on a first face of the lock provided for mounting a first key actuated cylinder having a first rotary driving bit on the frame;

a second mounting means on a second face, opposite said first face, of the lock provided for mounting a second key actuated cylinder having a second rotary driving bit on the frame, wherein each rotary driving bit is rotatable upon actuation of the respective key actuated cylinder along a locking direction and an unlocking direction, opposite to said locking direction, each rotary driving bit being arranged to be rotated in said unlocking direction to act upon a respective first actuation element provided on the dead bolt lever to pivot the dead bolt lever from its second into its first angular position and to be rotated in said locking direction to act upon a respective second actuation element provided on the dead bolt lever to pivot the dead bolt lever from its first into its second angular position, wherein the first actuation elements are provided on opposite sides of the dead bolt lever and wherein the second actuations elements are provided on opposite sides of the dead bolt lever; and

a locking mechanism arranged to lock the dead bolt in its retracted and its projected position, the locking mechanism comprising:

a spring biased lever mounted on the dead bolt lever and having a locking member;

a first catch provided on the frame; and

a second catch provided on the frame,

wherein said locking member is urged by said spring biased lever in said first catch when the dead bolt lever is in its first angular position to lock the dead bolt lever and thereby said dead bolt in its retracted position and wherein said locking member is urged by said spring biased lever in said second catch when the dead bolt lever is in its second angular position to lock the dead bolt lever and thereby said dead bolt in its projecting position,

wherein each rotary driving bit is arranged to, when the rotary driving bit is being rotated in said locking direction, act upon said locking member before the rotary driving bit acts upon its respective second actuation element on the dead bolt lever to move said locking member out of said first catch to unlock said dead bolt from its retracted position and to, when the rotary driving bit is being rotated in said unlocking direction, act upon said locking member before the rotary driving bit acts upon its respective first actuation element on the dead bolt lever to move said locking member out of said second catch to unlock said dead bolt from its projecting position.

2. The lock of claim **1**, wherein the spring biased lever is pivotally mounted on the dead bolt lever by means of a pivot and comprises a first end-part on a first side of the pivot and a second end-part on a second side of the pivot, opposite the first side, wherein the locking mechanism comprises a spring having a first end connected to the dead bolt lever and a second end connected to the second end-part of the spring biased lever, and wherein the locking member is provided on the first end-part of the spring biased lever.

3. The lock of claim **2**, wherein the spring biased lever comprises two arms on opposite sides of the dead bolt lever, each arm being pivotally mounted on the dead bolt lever, said two arms being connected by the locking member on the first end-part of the spring biased lever.

4. The lock of claim **3**, wherein said two arms are further connected by a transverse connection provided on the second end-part of the spring biased lever, said second end of the spring being fixed to the transverse connection.

5. The lock of claim **1**, wherein the dead bolt lever is pivoted about a pivot with respect to the frame and connects with the dead bolt on a first distance from said pivot to move the dead bolt from its retracted to its projecting position or vice versa, each of said rotary driving bits engaging the first and the second actuation elements on the dead bolt lever on a second distance from said pivot, which second distance is smaller than said first distance.

6. The lock of claim **1**, wherein said first catch and said second catch are provided on the first face of the lock and the locking mechanism comprises a further first catch and a further second catch provided on the frame on the second face of the lock, wherein said locking member is urged by said spring biased lever in said further first catch when the dead bolt lever is in its first angular position to lock the dead

bolt lever and thereby said dead bolt in its retracted position and wherein said locking member is urged by said spring biased lever in said further second catch when the dead bolt lever is in its second angular position to lock the dead bolt lever and thereby said dead bolt in its projecting position.

7. The lock of claim **6**, wherein the locking member is formed by a transverse pin extending through the dead bolt lever and having a first end cooperating with said first catch and said second catch, which transverse pin further has a second end, opposite the first end, cooperating with said further first catch and said further second catch.

8. The lock of claim **1**, wherein said first catch and said second catch is formed by a slot in the frame.

9. The lock of claim **8**, wherein said slot comprises a portion connecting said first catch and said second catch.

10. The lock of claim **1**, wherein said dead bolt is guided in the frame by at least two openings therein which are coaxially aligned such that said dead bolt in its retracted position projects at least 3 cm from said lock.

11. A lock for a hinged closure member, the lock comprising:

a frame having a front plate;

a dead bolt slidably mounted on the frame between a retracted position and a projecting position, which dead bolt protrudes through said front plate out of the lock;

a dead bolt lever which engages the dead bolt and which is pivotally mounted on the frame between a first angular position, wherein the dead bolt is in its retracted position, and a second angular position, wherein the dead bolt is in its projecting position;

a latch bolt slidably mounted on the frame between a retracted position and a projecting position and urged to its projecting position by a latch bolt spring, which latch bolt protrudes through said front plate out of the lock;

a second turn latch bolt lever pivotally mounted on the frame and cooperating with the latch bolt to move the latch bolt from its projecting position to its retracted position against the latch bolt spring upon rotation in a first rotational direction;

a second turn latch bolt driver having a distal end which is pivotally mounted on said second turn latch bolt lever and a proximal end which is slidably connected to the dead bolt lever, the proximal end of the second turn latch bolt driver having reciprocal movement in at least a first direction and in a second direction wherein it moves substantially away from and towards said front plate, the second turn latch bolt driver being arranged to rotate the second turn latch bolt lever in said first rotational direction when being moved in said first direction substantially along said front plate; and

mounting means provided for mounting a key actuated cylinder on the frame, the key actuated cylinder being provided with a rotary driving bit rotatable upon actuation of said key actuated cylinder and having a free extremity arranged to travel along a circular path along a locking direction and an unlocking direction, opposite to said locking direction, upon actuation of said key actuated cylinder, the rotary driving bit being arranged to be rotated in said unlocking direction to act upon a first actuation element provided on the dead bolt lever to pivot the dead bolt lever from its second into its first angular position and to be rotated in said locking direction to act upon a second actuation element provided on the dead bolt lever to pivot the dead bolt lever from its first into its second angular position,

wherein the second turn latch bolt driver comprises a second turn actuation portion, the rotary driving bit being further arranged to, when said rotary driving bit is rotated in said unlocking direction with the dead bolt lever in its first angular position, act upon said second turn actuation portion to move the second turn latch bolt driver in said first direction to rotate the second turn latch bolt lever in said first rotational direction,

wherein the lock further comprises a spring acting upon the second turn latch bolt driver to urge the second turn actuation portion in said second direction towards said circular path of said free extremity, and

wherein said second turn latch bolt driver further comprises a follower portion, the rotary driving bit being further arranged to, when said rotary driving bit has passed said second actuation element in said locking direction without the dead bolt lever being moved into said second angular position and when the rotary driving bit is rotated further in said locking direction, engage said follower portion to move the second turn actuation portion in said second direction out of said circular path against said spring.

12. The lock of claim **11**, wherein the slidable connection between the proximal end of the second turn latch bolt driver and the dead bolt lever comprises a protrusion cooperating with a slot.

13. The lock of claim **12**, wherein, when the dead bolt lever is rotated from its first angular position to its second angular position, the protrusion urges against a side of the slot to move the second turn latch bolt driver, against said spring, out of the circular path of the rotary driving bit.

14. The lock of claim **12**, wherein the slot is provided on the proximal end of the second turn latch bolt driver and the protrusion is provided on the dead bolt lever.

15. The lock of claim **12**, wherein the slot is L-shaped.

16. The lock of claim **11**, wherein said spring is fixed on one end to the proximal end of the second turn latch bolt driver and on the other end to the frame.

17. The lock of claim **11**, wherein said first rotational direction is the same as said unlocking direction.

18. The lock of claim **11**, wherein the second turn latch bolt driver comprises a protrusion having a front face and an end face, said follower portion being formed by the front face and said second turn actuation portion being formed by the end face.

19. The lock of claim **11**, wherein the lock comprises further mounting means provided for mounting a further key actuated cylinder on the frame, the further mounting means being provided on an opposite face of the lock with respect to the mounting means, the further key actuated cylinder being provided with a further rotary driving bit rotatable upon actuation of said further key actuated cylinder and having a further free extremity arranged to travel along a further circular path along the locking direction and the unlocking direction upon actuation of said further key actuated cylinder, the further rotary driving bit being arranged to be rotated in said unlocking direction to act upon a further first actuation element provided on the dead bolt lever to pivot the dead bolt lever from its second into its first angular position and to be rotated in said locking direction to act upon a further second actuation element provided on the dead bolt lever to pivot the dead bolt lever from its first into its second angular position,

wherein the second turn latch bolt driver comprises a further second turn actuation portion, the further rotary driving bit being further arranged to, when said rotary driving bit is rotated in said unlocking direction with

the dead bolt lever in its first angular position, act upon said further second turn actuation portion to move the second turn latch bolt driver in said first direction to rotate the second turn latch bolt lever in said first rotational direction, and

wherein said second turn latch bolt driver further comprises a further follower portion, the further rotary driving bit being further arranged to, when said further rotary driving bit has passed said further second actuation element in said locking direction without the dead bolt lever being moved into said second angular position and when the further rotary driving bit is rotated further in said locking direction, engage said further follower portion to move the further second turn actuation portion in said second direction out of said further circular path against said spring.

20. The lock of claim **19**, wherein the second turn actuation portion and the follower portion are formed on a first part of the second turn latch bolt driver and the further second turn actuation portion and the further follower portion are formed on a second part of the second turn latch bolt driver, said first part and said second part being located on opposite sides of the dead bolt lever and being connected with a transverse connection.

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